



ADVANTAGES OF SONIC DRILLING FOR ENVIRONMENTAL INVESTIGATIONS

- Fastest drilling method on earth for environmental investigations.
- World's most advanced drilling technique.
- Patented drilling technology exclusive to Sonic Drilling Ltd.
- Holes are drilled, cored and cased by rotating and vibrating the rod, core barrel and casing at resonant sonic frequencies.
- Sonic Drilling is ideal for investigating heavy metal, organic and other types of contamination.
- Ability to:
 - drill and core through landfill debris.
 - take water samples at any depth.
 - install continuous, multi-chamber well tubing.
 - install large diameter extraction, remediation and sparging wells.
 - drill without using drilling mud.
 - drill very straight holes.
 - drill angled holes.
 - perform many other types of drilling related operations.
- Sonic drilling allows for easy identification of perched water tables.
- Economical delineation of the contamination plume prior to remediation is easily achieved.
- Sonic drilling has a greater depth capability than required for most contaminated sites.
- The Sonic Drill is a safer machine to operate due to the use of smooth rods and casing. A tilting drill head and hydraulic break-out wrenches reduce manual labor and no auger flights increase operator safety.
- Overall risk to the client is minimized due to better knowledge of subsurface conditions and the ability of Sonic Drilling to tackle difficult ground conditions.



CORE SAMPLING

- The Sonic Drill is outstanding in its ability to provide continuous, highly representative, relatively undisturbed core samples through any geological formation including boulders and bedrock.
- Coring in overburden is performed as a completely dry process, producing core samples that range from 3" to 8" in diameter. All core samples are large enough to provide duplicate samples.
- Core samples are extruded into clear plastic sleeves, minimizing the loss of volatile organic compounds and reducing the risk of operator exposure to in-ground contaminants. The clear plastic sleeves allow field screening devices to provide immediate soil chemistry information.
- Core samples can be subjected to a detailed visual examination and analysis, followed by sampling, photographing and archiving for a permanent record of existing soil conditions. This allows for the creation of an accurate description of the lithology and stratigraphy of the underlying geological setting.
- Holes are cased after coring to prevent cross-contamination and borehole collapse. Casing and rod sizes range from 3" to 12" in diameter, can be installed either completely dry or by water flushing, and are designed to nest together.
- Dense Non Aqueous Phase Liquids (DNAPL) investigations can be performed effectively by casing off contaminated zones.



■ Hole through granite boulder



■ Granite core samples



■ Coal tar contaminated sample



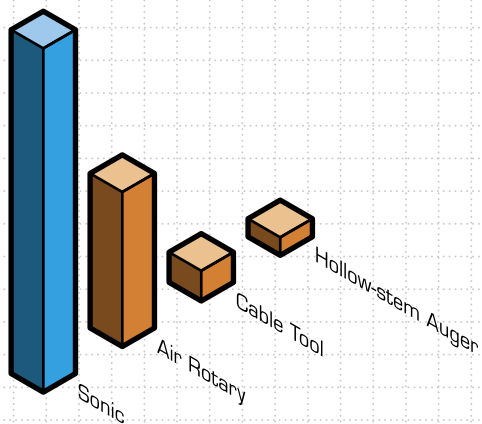
■ Field testing with a gas detector



■ Extruded core sample

EFFICIENCY

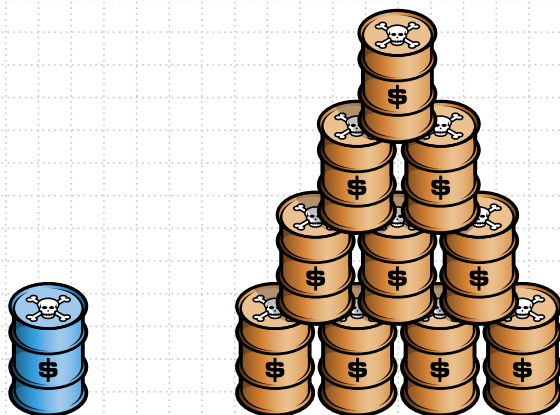
- Sonic Drilling is up to five times faster than hollow stem auger and substantially faster than other drilling methods. The noticeably faster drilling rate is the result of the advanced ultra-efficient sonic drilling technique.
- The faster drilling rate translates to a much lower cost per foot on site as compared to other drilling methods.
- Overall project costs are also reduced due to minimization of the oversight cost of field personnel and supervisory staff.



RATE OF SONIC DRILLING VS. OTHER METHODS



■ Installing large diameter casing for a recovery well



Sonic

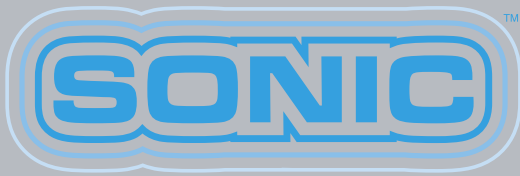
Other Drilling Methods

**WASTE GENERATED:
SONIC DRILLING VS. OTHER METHODS**

WASTE MANAGEMENT

- Sonic drilling generates considerably less waste than other drilling methods. Waste disposal and cleanup costs can be reduced by up to 80% less than auger, rotary and cable tool methods.





MONITORING WELLS

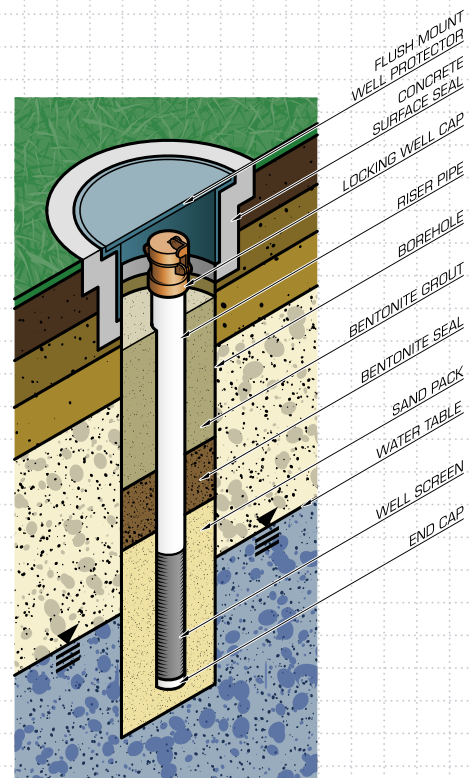
- Sonic Drilling utilizes a positive method of constructing monitoring wells by building the well inside the casing. The riser pipe, screen, bentonite seal and grout are inserted in the casing and the casing is then vibrated out of the ground, creating a perfect well installation. The vibrations help to center the well screen and riser pipe as well as eliminate bridging.
- Sonic drilling eliminates the concern of heaving sands and borehole collapses.
- Holes can be multi-cased with various casing sizes to seal off contamination zones.
- Multi-level wells can be constructed inside the casing, permitting isolated sampling of multiple aquifers.
- Well abandonment, when necessary, can be easily accomplished.



■ Well installation



■ Flush mount and above ground monitoring well protectors



TYPICAL MONITORING WELL CONSTRUCTION WITH THE SONIC DRILL